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ABSTRACT

A study examined the extent and nature of the problem of keeping secondary and postsecondary vocational and technical teachers in the United States up to date in the technology of their fields. During the study, 18 knowledgeable individuals were identified in 18 states to prepare papers on the need for and the problems of technological update of secondary and postsecondary vocational and technical teachers. Analysis of these papers indicates that large numbers of vocational and technical teachers at both the secondary and postsecondary levels are considered to have substantial or critical need for updating their knowledge of the technology of their field. Furthermore, this need exists for all occupational service areas examined. Despite the fact that a variety of approaches to technological update are being used, lack of resources in terms of money, time, and links with external organizations are seen as major barriers to the successful technological update of teachers. Among those approaches considered to have the greatest potential for successfully updating programs are workshops, conferences, and seminars as well as collaborative activities and programs among schools, business, and industry for teacher occupational experiences and curriculum content revision. Particularly needed is an overall teacher update plan that provides for effective selection, application, coordination, and management of the above-mentioned approaches. (MN)

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TECHNOLOGICAL UPDATE OF VOCATIONAL/ TECHNICAL TEACHERS: A STATUS REPORT

James B. Hamilton
Michael E. Wonacott
Adonia Simandjuntak

U.S. DEPARTMENT OF EDUCATION
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FOREWORD

The purpose of this report is to provide information on the extent and nature of the problem of keeping vocational/technical teachers in the United States, at both the secondary and postsecondary levels, up to date in the technology of their fields. This information should be useful to many vocational educators: teacher educators, vocational education professional development leaders, state and federal department of education personnel, secondary and postsecondary administrators, and any others responsible for planning, policymaking, or other duties related to this vital task of keeping teachers and instructors abreast of the changing technology of their fields.

Appreciation is extended to the following individuals who authored or coordinated the development of papers on the status of technological update at the secondary level in their states: Vic Van Hook, Oklahoma Department of Education; James Kendrick, Alabama Department of Education; Charles W. Wade, Kentucky Department of Education; George Ferns, Michigan State University; Franklin King, University of Missouri-Columbia; Joyce R. Moyer, Pennsylvania Research Coordinating Unit; Gloria Williams, Connecticut Department of Education; Gary Lloyd, Utah Office of Education; and R.D. Bristow, Texas Education Agency.

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Special recognition for major individual roles in the development of this product is extended to the following National Center staff: Lucille Campbell-Thrane, Associate Director, Development Division, and James B. Hamilton, Program Director, for leadership and direction of the project; Michael E. Wonacott,

Program Associate, for work with consultants during development of papers; Adonia Simandjuntak, Graduate Research Associate, for summarization and analysis of the information in the papers; Catherine C. King-Fitch for editorial review of the final paper; and Katheleen Petrella, for the many hours spent in typing the manuscript.

Robert E. Taylor
Executive Director
The National Center for Research
in Vocational Education

EXECUTIVE SUMMARY

This document reports the results of work in examining the extent and nature of the problem of keeping secondary and postsecondary vocational/technical teachers in the United States up to date in the technology of their fields.

The task of keeping vocational and technical teachers abreast of the technology of their occupational fields is becoming increasingly more important but, at the same time, more difficult. Rapidly expanding technologies and the application of new technology within existing occupations create needs for trained workers that many vocational and technical teachers are not equipped to handle. Many teachers, having acquired their technology-related skills during earlier stages of technology development, are finding those skills out of date. The rate of technological change and expansion makes continual updating of instructors' skills and knowledge a necessity. Yet, often this does not occur and the reduced turnover rate among teachers, accompanied by longer tenure in their positions, causes increasing disparity between their technical competence and current technology in their fields of instruction.

In addressing the multifaceted problem of technological update of teachers, a clearer picture was needed regarding the nature and dimensions of the problem. The specific objectives of this study were the following:

1. To determine the nature and extent of the problem at both secondary and postsecondary levels

2. To determine the extent of the problem relative to occupational areas
3. To identify the technologies in which the problem is most critical

Knowledgeable individuals were identified in nine states to prepare papers for the National Center presenting their perceptions of the nature and extent of the need for technological update of secondary vocational teachers in their respective states. The consultants were also asked to describe approaches used for technological update of teachers in their states, the apparent effectiveness of the approaches, and barriers to those approaches. Similarly, consultants were identified in an additional nine states to prepare papers presenting their perception of the nature and extent of the problem of technological update of postsecondary vocational/technical teachers and approaches utilized in their respective states.

Information regarding each topic addressed by the consultants was aggregated and summarized separately for those addressing vocational teacher technological update at the secondary level and those addressing it at the postsecondary level. Summarized information is presented in eighteen tables that are clustered by topical area for ease of comparison between the secondary and postsecondary levels.

Results of the study show that large numbers of vocational/technical teachers at both the secondary and postsecondary levels are considered to have substantial or critical need for updating in the technology of their teaching fields. Nearly one-half of

all postsecondary instructors are considered to be in need of update. The need exists for all occupational service areas at both the secondary and postsecondary levels; however, within occupational service areas, needs vary widely by occupational program. New technological developments or applications are considered to be the major factors contributing to the need.

A variety of approaches to technological update is used by each state, yet large numbers of both secondary and postsecondary vocational/technical teachers remain in need of update. Lack of resources in terms of money, time, and links with external organizations are seen as major barriers to successful technological update of teachers. Lack of awareness of need and lack of motivation on the parts of administrators and teachers are also considered significant barriers. There was nearly universal agreement among participants in the study that the approaches having the greatest potential for successful technological update of vocational/technical teachers are (1) workshops, conferences, and seminars and (2) collaborative activities/programs between schools and business/industry for teacher occupational experiences and curriculum content revision.

Analysis of the findings of this status study point out the need for developing an overall plan or strategy for teacher technological update that provides for effective selection, application, coordination, and management of existing technological updating approaches and creative adaptations of approaches. Need for technological update should be identified on a state-by-state basis, since update programs tend to be

planned and initiated on no larger than a statewide basis. Studies are needed to explore ways that federal, state, university, and local district resources might most effectively impact upon the problem of technological update of vocational/technical teachers.

INTRODUCTION

The task of keeping vocational and technical teachers abreast of the technologies of their own occupational fields is becoming increasingly more important, but at the same time, more difficult. Most state and local areas, for example, require individuals to have three to five years of occupational trade experience before receiving a certificate to teach vocational education. The intent of this requirement is to ensure that the instruction provided to vocational students is relevant and technologically up to date and that it results in the rapid transition of vocational graduates to productive employment.

Rapidly expanding technologies and the application of new technology within existing occupations create needs for trained workers that many vocational and technical teachers are not equipped to handle. Many teachers, having acquired their technology-related skills and knowledge during earlier states of technology development, are finding those skills out of date. This is especially evident among high-technology programs at the postsecondary level or in program areas where new technologies tend to be combined (e.g., electromechanics), thus demanding broader technical background for teachers.

The rate of technological change and expansion makes continual updating of instructors' skills and knowledge a necessity. As Van Ast stated in a recent article, "with technology moving faster than most Americans can imagine, technical updating of vocational-technical instructors is a major priority" (1982, p. 33). Another journal presented a community college staff

member's testimony to the House Subcommittee on Elementary, Secondary and Vocational Education under the headline "Technical Obsolescence Poses Threat to Vocational Education" (Muehlenthaler 1982). George Storm addressed the importance of technological update at the postsecondary level thus:

> In-service programs have almost become a requirement in the professions during the last decade. The increasing speed of technological change creates corresponding demands for periodic recertification of technicians. Technological changes in business and industry leave no alternate choices to postsecondary occupational educators. If they want to remain competent instructors, they must maintain expertise in the latest technical developments in their respective occupations. (1978, p. 11)

In spite of recognition of the need for continual updating of instructors' skills and knowledge, often the updating does not occur. The reduced turnover rate among teachers, accompanied by longer tenure in their positions, further increases the disparity between their technical competence and the current technology in their fields of instruction.

Doty and Cappelle, referring to George Storm's work on technical upgrading, concluded that "inservice technical upgrading of postsecondary technical instructors . . . was found to be the most ignored area of staff development" (1981, p. 1). Storm himself reported that his nationwide survey "indicated widespread, nearly unanimous interest in technical upgrading of postsecondary professional personnel" but that it revealed that "in spite of this positive interest few postsecondary institutions have in-service programs that satisfactorily serve the technical upgrading needs of their respective instructors and administrators" (1978, p. 10).

Part of the problem seems to result from the fact that teaching institutions and state education agencies tend to place greater emphasis on pedagogical update than on technical update.

> While post-secondary institutions encourage their instructors to upgrade themselves, they rarely require the upgrading to be in the technical specialty. Consequently, the upgrading efforts of many instructors are solely in graduate level education courses necessary for advanced education degrees. (Storm 1978, p. 12)

Another problem is that, as more institutions develop programs to meet high-technology demands, the supply of qualified teaching staff is being siphoned off into industry. A national shortage of engineering and technical personnel lures many qualified teachers and potential teachers away from teaching careers and into industry. For example, in computer graphics, a supply of qualified personnel barely exists, for either vocational education or industry.

To cope with the problem, institutions and some states have explored numerous approaches to providing technological update for their teachers. These approaches range from more traditional courses, workshops, and summer occupational experience to the use of microcomputers and a wide variety of exchange programs between business and industry and educational institutions. As a means of coping with the need for instructors who are technologically up to date in their fields, some institutions employ only part-time instructors who are currently employed in business or industry. However, since both industry and education compete for the same pool of qualified personnel, this approach has many disadvantages. In fact, no single approach to updating seems to

meet the needs of all teachers or to address the special circumstances found in the various service areas and localities. Many approaches and combinations have been tried, with varying degrees of success. And yet, there still has been relatively little global understanding of what is being done, what works, and why. More information is needed about the current status of technological update at both the secondary and postsecondary levels--present approaches, promising practices, and their relative merits and applications--as a basis for further planning in this area. Research to date has been scanty.

Robert Roehrich, in his 1979 study, addressed technical updating in two-year technical colleges. However, his focus was training assessment criteria for identifying update needs; although his survey questions did touch upon time spent in technical updating and resources or incentives provided for updating, little attention was given to present approaches, promising practices, or their relative effectiveness.

George Storm's 1976 survey has stood alone in its attempt to take a national perspective on the problem. While his has been the most comprehensive work to date, its focus is strictly on postsecondary programs, and it therefore does not address the broad area of the technical update situation that secondary vocational education represents.

Storm himself underscored the need for further research on the subject:

> Viewing the various technical upgrading activities across the nation the outlook appears to be promising; however, without adequate research data on this subject we can only suspect that in spite of these activities, many post-secondary vocational-technical instructors fail to participate in them. (1976, p. 255)

While Storm's comments focused on postsecondary instructors, the need for more information applies equally to secondary and postsecondary vocational education.

It was the recognition of this need for a better understanding of the technological update problem that led to this study. The purpose of the study was to examine the extent and nature of the problem of technological update of vocational/technical teachers at both the secondary and postsecondary levels in the United States.

The following specific objectives provided direction in identification of the dimensions of the problem of technological update of vocational and technical teachers:

1. To determine the extent of the problem at both secondary and postsecondary levels
2. To determine the extent of the problem relative to occupational areas
3. To identify the technologies in which the problem is most critical

DESIGN OF THE STUDY

Initial planning called for conducting mail surveys concerning the status of technological update of vocational teachers in samplings of secondary and postsecondary institutions throughout the United States. Study of recent work of the National Center and of the literature suggested that there were

several individuals at both the secondary and postsecondary levels throughout the country who had recently addressed the need for or approaches to technological update in their respective states. It appeared that such persons might knowledgeably address both the need for teacher technological update and approaches utilized within their respective states, thus eliminating the necessity of a more time-consuming process of instrument design, instrument clearance procedures, and data collection that would be necessary in obtaining primary-source data from individual institutions.

It was therefore determined that knowledgeable individuals would be identified in nine states to prepare papers for the National Center presenting their perceptions of the nature and extent of the need for technological update of secondary vocational teachers in their respective states. The consultants were also asked to describe approaches used for technological update of teachers in their states, the apparent effectiveness of the approaches, and barriers to those approaches. Similarly, consultants were identified in an additional nine states to prepare papers presenting their perceptions of the nature and extent of the problem of technological update of postsecondary vocational/technical teachers and approaches utilized in their respective states.

Selection of States and Consultants

Criteria were established for the selection of states to be represented in the status study and for the selection of consultants to prepare papers addressing the need and approaches

utilized. Criteria for selection of states included the following:

1. All geographic regions of the United States would be represented in each of the two sets of nine states chosen.

2. States chosen would represent each of the following classifications: predominantly industrial states, predominately agricultural states, and those in between. These classifications were determined by examining the ratios of values of farm commodities to values of manufacturing (Sachs 1981, p. 660).

3. States with statewide systems of area vocational schools and states without such systems would be included in the secondary set.

4. States with statewide systems of postsecondary institutions and those without such systems would be included in the postsecondary set.

5. States requiring certification of postsecondary vocational/technical teachers and states not requiring such certification would be included in the postsecondary set.

The major criterion in the selection of individual consultants was that they filled positions in which they were aware of the various aspects of the problem and approaches to meeting needs for technological update of vocational teachers or postsecondary instructors in their states.

First a listing of potential consultants was compiled through literature searches to identify individuals knowledgeable regarding teacher technological update at the secondary and/or postsecondary levels. State directors of vocational education were contacted, either directly at a meeting of new state directors held at the National Center or by letter, asking them to nominate the two most knowledgeable individuals in their respective states regarding technological update of secondary

vocational teachers. They were also asked to suggest the most knowledgeable individuals regarding technological update of postsecondary instructors. Similarly, state coordinators of postsecondary vocational/technical education were asked by letter to nominate one or more potential consultants.

Two sets of potential consultants and states were then developed using the classification of states and the listings of potential consultants: one set of nine consultants to address the secondary level and one set of nine consultants to address the postsecondary level. In selection of candidate consultants, priority was given to those consultants receiving multiple recommendations and/or having evidence (e.g., through the literature) of expertise regarding the problem. For each state and consultant selected, an alternate state and consultant were identified for substitution in the event that the first consultant was unable to undertake or complete the task. With this approach to the selection of states and consultants, it was possible to include in the study most states that were recognized through the literature as giving attention to the need for technological update of teachers and/or utilizing specific approaches in addressing such needs.

Figure 1 shows the geographical distributions of the states included at the secondary and postsecondary levels. Listings of the consultants who prepared papers and their respective states are shown in Appendix A. Of the initial eighteen consultants and states chosen, thirteen developed papers. In four cases it was necessary to go to the backup consultant and state in order to

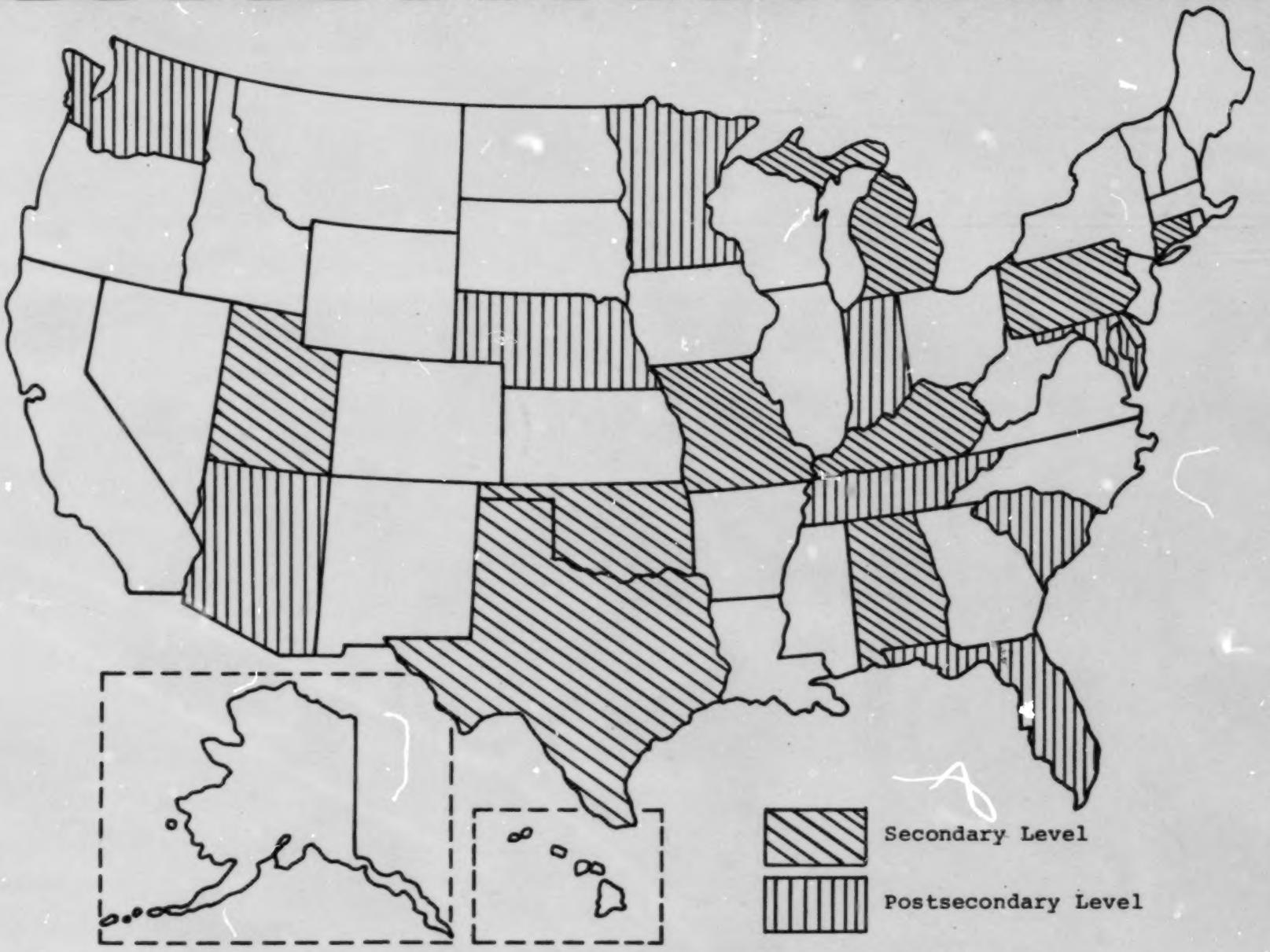

Figure 1. States for which consultant papers were developed on technological update of vocational/technical teachers

secure a commitment to development of the paper within the allotted time frame. In one case, although the selected consultant was unable to develop the paper because of other demanding responsibilities, a qualified replacement was available within the state.

Development of Consultant Papers

In order to ensure a degree of comprehensiveness of treatment of the problem area by each consultant and to achieve a degree of uniformity of organization within the papers, a topical outline was developed by National Center staff for use by secondary consultants. A similar outline was developed for use by consultants addressing the problem at the postsecondary level. See Appendix B for a sample outline. National Center project staff were available to respond to questions and for consultation by telephone during the development of the papers.

Although consultants were selected because of their knowledge, interest, and expertise regarding vocational teacher technological update in their respective states, most sought additional input from vocational service area supervisors, professional development coordinators, directors, and other knowlegeable individuals as they developed their papers. In some cases, the paper was a result of a collaborative effort of several individuals and the consultant. In several cases the consultant had recently conducted a study of the need for technological update of vocational/technical teachers in the state. Knowledge of such collaboration and previously conducted

studies serves to increase the confidence one can place in the perceptions reported by individual consultants.

Summarization and Analysis of Consultant Papers

Information regarding each topic addressed by the consultants was aggregated and summarized separately for those addressing technological update at the secondary level and those addressing it at the postsecondary level. However, the same procedures were utilized in summarization of information provided by both groups of consultants. Vocational/technical education programs offered within each state were aggregated using the form Occupational Areas and Program Offerings, which had been supplied to consultants as a part of the topical outline (see Appendix B). In most cases, educational programs not appearing on the form had been included as "other" programs under appropriate occupational areas by consultants. Therefore, when additional educational programs were listed by consultants, these were also included as "other" under the appropriate occupational area.

Numbers of instructors in each program were aggregated across the nine states, as were the consultants' estimates of the numbers of instructors in each program having "no need," "limited need," "substantial need," and "critical need" for updating in the technology of their teaching fields. Percentages were then calculated to indicate the proportion of all instructors in each specific educational program offering that were considered by consultants to possess the various levels of need for technological update.

Nonnumeric information from consultant papers was summarized by listing individual responses to topical outline questions, clustering, and enumerating the same and very similar responses. In the analysis, information provided was examined for possible relationship between various levels of perceived need for technological update and the types of approaches to technological update employed, apparent levels of resources committed to the effort, and perceived facilitators and barriers to technological update of teachers/instructors.

NEED FOR TEACHER TECHNOLOGICAL UPDATE

The consultants for each of the states included in the study were asked to identify specific programs offered at the secondary or postsecondary level in their respective states and to indicate the number of instructors teaching in each program area. They were then asked to estimate, for each program offering, the numbers of instructors having no need, limited need, substantial need, and critical need for technological update.

One consultant for the postsecondary level and two consultants for the secondary level were reluctant to make such estimates without benefit of considerably more primary-source data. Numbers of instructors and percentages of instructors were therefore limited to the eight states estimating levels of need for postsecondary instructor updating and the seven states estimating levels of need for secondary teacher updating.

Need for Update by Occupational Service Area

Estimated numbers and percentages of teachers at each level of need at both the secondary and postsecondary levels were summarized for each of the six occcupational service areas suggested to the consultants. Trade and industry and technical were included as one area to avoid the difficulty of making consistent and meaningful distinctions, especially among postsecondary programs.

Postsecondary

The occupational areas (see table 1) showing the most critical need for technological update of postsecondary instructors are office occupations (29%) and technical and trade and industry (26%). When those having substantial need and those having critical need are combined, we find that nearly half (47%) of all postsecondary occupational instructors are considered in need of technological update in the technology of their teaching fields. In terms of the updating job to be done, an estimated 4,462 postsecondary instructors in just eight states are in need of technological updating. By occupational area the range is from a high of 54% for office occupations to a low of 27% for marketing and distribution. Approximately one-half of the postsecondary instructors in need of update are in the area of technical and trade and industry.

Secondary

Percentages of secondary vocational teachers in need of technological update for each of the six occupational areas (see

Table 1

Need for Technological Update of Postsecondary Instructors by Occupational Areas in Eight Selected States

Occupational Area	Number of Instructors	Numbers and Percentages of Instructors in Need of Updating in the Technology of Their Teaching Field							
		No Need		Limited Need		Substantial Need		Critical Need	
		No.	%	No.	%	No.	%	No.	%
Agriculture	302	21	7	137	45	86	28	58	19
Marketing and Distribution	493	124	25	239	48	97	20	37	7
Home Economics-Occupational	389	36	9	188	48	105	27	60	15
Health Occupations	1359	319	23	620	46	277	20	143	11
Office Occupations	2558	326	13	846	33	640	25	746	29
Technical and Trade and Industry	4511	763	17	1535	34	1056	23	1157	26
TOTALS	9612	1589	17	3565	37	2261	24	2201	23

NOTE: "Need" is that identified or estimated by knowledgeable consultants from each state. Only eight of the nine states are represented because one of the consultants was reluctant to make estimates without further primary-source information.

table 2) generally ranged lower than those for postsecondary instructors, with technical and trade and industry the only occupational area showing more than 10% of the instructors in critical need of technological update. When those having substantial need and those having critical need are combined, however, 30% of all secondary vocational teachers were considered in need of updating in the technology of their teaching fields. Although the percentages of secondary teachers considered to be in need of technological update are lower than the percentages of postsecondary instructors, in terms of the job to be done the estimated 8,178 secondary teachers in need of update in seven states is nearly double that of the estimated 4,462 postsecondary instructors in eight states. Approximately one-third of the secondary teachers in need of update are in the area of technical and trade and industry.

Need for Update within Occupational Service Areas

Estimated numbers and percentages of teachers at each level of need at both the secondary and postsecondary levels were summarized for each instructional program within each of the six occupational service areas suggested to the consultants. These summary data are presented here by occupational service area, showing and discussing the data first for the postsecondary level and then for the secondary level for that occupational area.

Agricultural Instructional Programs

At the postsecondary level (table 3), the most critical need for instructor technological update was for horticulture instructors (38%), ranging to a low of 0% for instructors

Table 2

Need for Technological Update of Secondary Teachers by Occupational Areas in Seven Selected States

Occupational Area	Number of Teachers	Numbers and Percentages of Teachers in Need of Updating in the Technology of Their Teaching Field							
		No Need		Limited Need		Substantial Need		Critical Need	
		No.	%	No.	%	No.	%	No.	%
Agriculture	5,952	1205	20	2961	50	1455	24	331	6
Marketing and Distribution	2,501	218	9	1741	70	472	19	70	3
Home Economics - Occupational	5,326	2736	51	1565	21	796	15	229	4
Health Occupations	1,122	98	9	575	51	380	34	69	6
Office Occupations	6,206	2681	43	1856	30	1366	22	303	5
Technical and Trade and Industry	6,380	1078	17	2595	41	1827	29	880	14
TOTALS	27,487	8016	29	11293	41	6296	23	1882	7

NOTE: "Need" is that identified or estimated by knowledgeable consultants from each state. Only seven of the nine states are represented because two of the consultants were reluctant to make estimates without further primary-source information.

Table 3

Need for Technological Update of Postsecondary Agricultural Instructors by Instructional Program in Eight Selected States

Agriculture Instructional Program	Number of Instructors	Numbers and Percentages of Instructors in Need of Updating in the Technology of Their Teaching Field							
		No Need		Limited Need		Substantial Need		Critical Need	
		No.	%	No.	%	No.	%	No.	%
Agricultural Production	93	1	1	56	60	24	26	12	13
Agricultural Mechanics	33	2	6	15	45	12	36	4	12
Agricultural Service	38	4	11	23	61	8	21	3	8
Horticulture	103	13	13	22	21	29	28	39	38
Other	35	1	3	21	60	13	37	0	0
TOTALS	302	21	6	137	45	86	28	58	19

categorized as being in "other" instructional programs. When those having substantial need and those having critical need are combined, horticulture instructors continue to have the highest percentage of instructors in need of updating at 66%, ranging to a low of 29% for agricultural service instructors. Although the percentages of postsecondary agricultural instructors considered in need of technological update is 47% across all instructional programs, the estimated number of teachers so classified in the eight states represented is but 144.

At the secondary level (table 4), the highest percentages of agriculture teachers considered to be in critical need of technological update are found among horticulture teachers (20%), ranging to a low of 3% for production agriculture teachers. When those having substantial need are combined with those having critical need, the percentages range from a high of 51% for horticulture teachers to a low of 26% for production agriculture teachers. In considering estimated numbers of secondary agriculture teachers in need of technological update, it should be noted that agricultural production teachers in need of technological update outnumber the teachers in all other agricultural instructional programs combined.

It should also be noted that, although percentages of teachers in need of technological update at the postsecondary level consistently ranged higher than at the secondary level, the estimated numbers of teachers in need of technological update (combining substantial need and critical need) were more than twelve times greater at the secondary level (1,786) than at the postsecondary level (144).

Table 4

Need for Technological Update of Secondary Vocational Agriculture Teachers by Instructional Program in Seven Selected States

Agriculture Instructional Program	Number of Teachers	Numbers and Percentages of Instructors in Need of Updating in the Technology of Their Teaching Field							
		No Need		Limited Need		Substantial Need		Critical Need	
		No.	%	No.	%	No.	%	No.	%
Agricultural Production	3,489	922	26	1665	48	802	23	100	3
Agricultural Mechanics	1,050	168	16	472	45	292	28	118	11
Agricultural Service	551	24	4	371	67	139	25	17	3
Horticulture	320	44	14	114	36	98	31	64	20
Other	542	47	9	339	63	124	23	32	6
TOTALS	5,952	1205	20	2961	50	1455	24	331	6

Marketing and Distribution Instructional Programs

At the postsecondary level (table 5), hotel/motel program instructors showed the most critical need for technological updating (32%). When substantial need and critical need categories were combined, the hotel/motel program instructors continued to lead with 48% in need of update. In considering estimated numbers of instructors in need of update, general merchandising instructors led with 56, compared to 33 for hotel/motel program instructors. Fully one-half (255 of 493) of the postsecondary marketing and distribution instructors were classified in the "other" instructional program category. Many of these were not identified by instructional program beyond "other." Those "other" programs identified represented a diversity of instructional programs with little or no duplication among the eight states represented.

Generally lower percentages of marketing and distribution teachers at the secondary level were considered to be in need of technological update than at the postsecondary level (table 6). Nearly 9 out of 10 secondary marketing and distribution teachers were in general merchandising, and of those, 21% or 451 teachers were estimated to be in need of update in the technology of their teaching field. The need was considered at the critical level for 3% of the secondary marketing and distribution teachers.

Occupational Home Economics Instructional Programs

While percentages of postsecondary occupational home economics instructors in need of technological update (table 7) were higher than in some other areas, the estimated numbers of

Table 5

Need for Technological Update of Postsecondary Marketing and Distribution Instructors by Instructional Program in Eight Selected States

Marketing and Distribution Instructional Program	Number of Instructors	Numbers and Percentages of Instructors in Need of Updating in the Technology of Their Teaching Field							
		No Need		Limited Need		Substantial Need		Critical Need	
		No.	%	No.	%	No.	%	No.	%
General Merchandising	174	43	25	75	43	45	26	11	6
Hotel/Motel	68	13	19	22	32	11	16	22	32
Other	255	68	27	142	56	41	16	4	2
TOTALS	497	124	25	239	48	97	20	37	7

Table 6

Need for Technological Update of Secondary Marketing and Distribution Teachers by Instructional Program in Seven Selected States

Marketing and Distribution Instructional Program	Number of Teachers	Numbers and Percentages of Instructors in Need of Updating in the Technology of Their Teaching Field							
		No Need		Limited Need		Substantial Need		Critical Need	
		No.	%	No.	%	No.	%	No.	%
General Merchandising	2210	201	9	1558	70	389	18	62	3
Hotel/Motel	37	3	8	25	68	9	24	0	0
Other	254	14	6	158	62	74	29	8	3
TOTALS	2501	218	9	1741	70	472	19	70	3

Table 7

Need for Technological Update of Postsecondary Occupational Home Economics Instructors by Instructional Program in Eight Selected States

Occupational Home Economics Instructional Program	Number of Instructors	Numbers and Percentages of Instructors in Need of Updating in the Technology of Their Teaching Field							
		No Need		Limited Need		Substantial Need		Critical Need	
		No.	%	No.	%	No.	%	No.	%
Child Development	95	20	21	55	58	13	14	7	7
Sewing and Tailoring	50	4	8	22	44	16	32	8	16
Foods and Nutrition	30	2	7	21	70	5	17	2	7
Interior Decorating	19	2	11	4	21	8	42	5	26
Other	195	8	4	86	44	63	32	38	19
TOTALS	389	36	9	188	48	105	27	60	15

teachers in need of update were relatively low. When combining the substantial and critical need categories, interior decorating showed the highest percentage (68%); however, this represented but 13 teachers. Sewing and tailoring instructors showed 48% in need of technological update; however, this represented only 24 teachers in need of update.

The "other" category of instructional programs accounted for fully one-half of the postsecondary occupational home economics teachers, showing 51% or 101 teachers in need of technological update. Many of these instructors were not identified by program title by the consultants. Those "other" programs identified represented a diversity of instructional programs, with no clear indicators of patterns of need among the states represented.

Among secondary occupational home economics instructional programs, interior decorating showed the highest percentage of need for teacher technological update (table 8). Although percentages of teachers in critical need of update were quite low for all instructional programs, the combined categories of substantial and critical need show 32% or an estimated 582 secondary interior decorating teachers in need of technological update in the seven states included in these estimates.

Health Occupations Programs

At the postsecondary level, inhalation therapy and nursing were the only health occupations programs in which instructor need for update was considered critical by the consultants (table 9). Although the percentage of inhalation therapy instructors in critical need of technological update was 27% compared to 17%

Table 8

Need for Technological Update of Secondary Occupational Home Economics Teachers by Instructional Program in Seven Selected States

Home Economics Instructional Program	Number of Teachers	Numbers and Percentages of Instructors in Need of Updating in the Technology of Their Teaching Field							
		No Need		Limited Need		Substantial Need		Critical Need	
		No.	%	No.	%	No.	%	No.	%
Child Development	875	653	75	149	17	58	6	15	2
Sewing and Tailoring	1089	734	67	193	18	117	11	45	4
Foods and Nutrition	1118	915	82	89	8	86	8	28	3
Interior Decorating	1801	427	24	792	44	454	25	128	7
Other	443	7	2	342	77	81	18	13	3
TOTALS	5326	2736	51	1565	29	796	15	229	4

Table 9

Need for Technological Update of Postsecondary Health Occupations Instructors by Instructional Program in Eight Selected States

Health Occupations Instructional Program	Number of Instructors	Numbers and Percentages of Instructors in Need of Updating in the Technology of Their Teaching Field							
		No Need		Limited Need		Substantial Need		Critical Need	
		No.	%	No.	%	No.	%	No.	%
Nursing	712	173	24	278	39	140	20	121	17
Medical Assistant	39	8	21	23	59	8	21	0	0
Medical Laboratory Assistant	92	18	20	61	66	13	14	0	0
Dental Assistant	160	27	17	58	36	75	47	0	0
Dental Laboratory Assistant	24	5	21	16	67	3	13	0	0
Inhalation Therapy	82	18	22	28	34	14	17	22	27
Physical Therapy	10	5	50	5	50	0	0	0	0
Occupational Therapy	12	0	0	11	92	1	8	0	0
Operating Room Assistant	37	3	8	29	78	5	14	0	0
Other	191	62	32	111	58	18	9	0	0
TOTALS	1359	319	23	620	46	277	20	143	11

for nursing, the estimated number of nursing instructors in critical need (121) was much greater than the number of inhalation therapy instructors (22). When numbers of instructors in substantial need of updating are combined with those considered in critical need, we find that nursing leads with 261 (37%), followed by dental assisting with 75 (47%), then inhalation therapy with 36 (44%). The other postsecondary health occupations instructors in need of update were relatively low in numbers and in percentages.

At the secondary level (table 10), more nursing teachers (116) were considered in need of update than were teachers in other health occupations programs. Medical laboratory assistant and dental assistant teachers in need of update showed higher percentages (39% and 42% respectively); however, estimated numbers of teachers in need of update were relatively low. Approximately one-fourth of all secondary health occupations teachers were listed in the "other" program category, with 60% or 236 teachers considered to be in need of technological update. Again, sufficient information was not available to further identify specific instructional programs in which the individuals taught.

Office Occupations Programs

The need for technological update among postsecondary office occupations instructors (table 11) was not only higher than in several other occupational areas, but the high level of need was rather consistent across all instructional programs shown with the exception of office machines programs. Overall, 54% or an

Table 10

Need for Technological Update of Secondary Health Occupations Teachers by Instructional Program in Seven Selected States

Health Occupations Instructional Program	Number of Teachers	Numbers and Percentages of Instructors in Need of Updating in the Technology of Their Teaching Field							
		No Need		Limited Need		Substantial Need		Critical Need	
		No.	%	No.	%	No.	%	No.	%
Nursing	332	18	6	188	58	84	26	32	10
Medical Assistant	127	12	9	93	73	14	11	8	6
Medical Laboratory Assistant	58	7	12	24	48	20	34	3	5
Dental Assistant	69	6	9	34	49	16	23	13	19
Dental Laboratory Assistant	9	3	33	6	67	0	0	0	0
Inhalation Therapy	64	2	3	42	66	20	31	0	0
Physical Therapy	-	-	-	-	-	-	-	-	-
Occupational Therapy	66	0	0	66	100	0	0	0	0
Operating Room Assistant	14	6	43	6	36	3	21	0	0
Other	393	44	11	113	29	223	57	13	3
TOTALS	1122	98	9	575	51	380	34	69	6

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Table 11

Need for Technological Update of Postsecondary Office Occupations Instructors by Instructional Program in Eight Selected States

Office Occupations Instructional Program	Number of Instructors	Numbers and Percentages of Instructors in Need of Updating in the Technology of Their Teaching Field							
		No Need		Limited Need		Substantial Need		Critical Need	
		No.	%	No.	%	No.	%	No.	%
Typing	420	54	13	183	44	56	13	127	30
Stenography	447	103	23	106	24	86	19	152	34
Accounting	435	87	20	172	40	113	26	63	14
Office Machines	59	15	25	31	53	12	20	1	2
Word Processing	98	10	10	41	42	33	34	14	14
Other	1099	57	5	313	28	340	31	389	35
TOTALS	2558	326	13	846	33	640	25	746	29

estimated 1,386 instructors were considered to be in substantial need or critical need of updating in the technology of their teaching field. Percentages of instructors in need of update ranged from a high of 66% for instructors in the "other" program category to a low of 22% for office machines program instructors.

At the secondary level (table 12), 27% of all office occupations teachers (1,669 teachers) were considered to have substantial or critical need for updating in the technology of their teaching field. Percentages of teachers in need of update ranged from a high of 81% for word processing program teachers to a low of 11% for teachers of programs in the "other" category. Typing and stenography teachers accounted for the bulk of secondary office occupations teachers in need of update.

In contrasting patterns of need for update of office occupations teachers, the percentage of postsecondary instructors (29%) considered to be in critical need of technological update is much higher than the percentage of secondary office occupations teachers.

Technical and Trade and Industry Programs

In examining the percentages of postsecondary technical and trade and industry instructors considered to be in critical need of update in the technology of their teaching field (table 13), we find 14 instructional programs with 30% or more of their instructors considered in critical need of update. When we combine percentages of instructors considered to be in substantial need of update with those considered to be in critical need, we find that 19 of the 34 instructional programs

Table 12

Need for Technological Update of Secondary Office Occupations Teachers by Instructional Program in Seven Selected States

Office Occupations Instructional Program	Number of Teachers	Numbers and Percentages of Instructors in Need of updating in the Technology of Their Teaching Field							
		No Need		Limited Need		Substantial Need		Critical Need	
		No.	%	No.	%	No.	%	No.	%
Typing	1120	25	2	515	46	464	41	116	10
Stenography	1996	774	39	622	31	530	27	70	4
Accounting	1295	939	73	196	15	153	12	7	<1
Office Machines	340	105	31	174	51	54	16	7	2
Word Processing	146	5	3	22	15	60	41	59	40
Others	1309	833	64	327	25	105	8	44	3
TOTALS	6206	2681	43	1856	30	1366	23	303	5

Table 13

Need for Technological Updace of Postsecondary Technical and Trade and Industry Instructors by Instructional Program in Eight Selected States

Technical and Trade and Industry Instructional Program	Number of Instructors	Numbers and Percentages of Instructors in Need of Updating in the Technology of Their Teaching Field							
		No Need		Limited Need		Substantial Need		Critical Need	
		No.	%	No.	%	No.	%	No.	%
Air Conditioning/ Refrigeration	197	23	12	62	31?	45	23	67	34
Appliance Repair	33	0	0	4	12	17	52	12	36
Auto Mechanics	522	61	12	101	19	134	26	226	43
Auto Body	59	6	10	22	37	24	41	7	12
Aviation Mechanics	87	19	22	16	18	21	24	31	36
Building Construction	199	32	16	50	25	37	19	80	40
Business Machine Repair	21	0	0	2	10	1	5	18	86
Chemical Technology	38	3	8	21	55	12	32	2	5
Civil Technology	39	10	26	16	41	12	31	1	3
Commercial Art	76	10	13	37	49	14	18	15	20
Cosmetology	95	5	5	2	2	18	20	70	74
Data Processing (Computer)	340	106	31	158	46	54	16	22	6
Diesel Mechanics	105	18	17	31	29	32	30	24	23
Drafting	266	27	10	61	23	81	30	97	36

Table 13 (continued)

Need for Technological Update of Postsecondary Technical and Trade and Industry Instructors by Instructional Program in Eight Selected States

Technology and Trade and Industry Instructional Program	Number of Instructors	Numbers and Percentages of Instructors in Need of Updating in the Technology of Their Teaching Field							
		No Need		Limited Need		Substantial Need		Critical Need	
		No.	%	No.	%	No.	%	No.	%
Electricity	216	20	10	78	36	65	30	53	25
Electronics	464	61	13	101	22	158	34	144	31
Environmental Technology	33	7	21	26	79	0	0	0	0
Fire Science	86	7	8	17	20	28	33	34	40
Fisheries	17	12	71	5	29	0	0	0	0
Food Service (Culinary Arts)	68	5	7	13	19	23	34	27	40
Heavy Equipment Maintenance	38	1	3	16	42	9	24	12	32
Masonry	67	9	13	17	25	10	15	31	46
Machine Trades	237	43	18	108	46	45	19	41	17
Mechanical Technology	55	11	20	27	49	11	20	6	11
Painting & Decorating	12	4	33	4	33	4	33	0	0
Photography	39	9	23	28	71	2	5	0	0
Plumbing	42	7	17	9	21	16	38	10	24
Police Science	131	46	35	76	58	8	6	1	1
Printing & Graphics	125	32	26	41	33	29	23	23	18

Table 13 (continued)

Need for Technological Update of Postsecondary Technical and Trade and Industry Instructors by Instructional Program in Eight Selected States

Technical and Trade and Industry Instructional Program	Number of Instructors	Numbers and Percentages of Instructors in Need of Updating in the Technology of Their Teaching Field							
		No Need		Limited Need		Substantial Need		Critical Need	
		No.	%	No.	%	No.	%	No.	%
Radio-TV	71	8	11	36	51	18	25	9	13
Sheet Metal	28	7	25	7	25	1	4	13	46
Small Engine Repair	70	2	3	20	29	29	41	19	27
Textiles	12	4	33	5	42	2	16	1	8
Welding	304	38	13	153	50	57	19	56	18
Other	319	110	34	165	52	39	12	5	2
TOTALS	4511	763	17	1535	34	1056	23	1157	26

listed show 50% or more of the instructors in need of technological update. These percentages range as high as 94% for cosmetology program instructors. In considering numbers of instructors in need of technological update in the eight states represented, we find 15 instructional programs in which at least 50 instructors are in need of update. Of these, auto mechanics, electronics, drafting, electricity, building construction, and air conditioning/refrigeration programs (in that order) lead in the total numbers of postsecondary instructors in need of update in the technology of their teaching fields.

At the secondary level, the percentage of technical and trade and industry teachers considered to be in critical need of technological update exceeded 30% only for electronics teachers, with 36% classified as being in critical need (table 14). Overall, the percentage of secondary technical and trade and industry teachers considered to be in substantial need of technological update exceeded that for postsecondary instructors (29% compared to 23%). When we combine percentages of secondary teachers considered to be in substantial need with those considered to be in critical need, we find that 7 of the 34 instructional programs listed show 50% or more of the teachers in need of technological update. These percentages range as high as 86% for electronics teachers. In considering numbers of secondary teachers in need of technological update in the seven states represented, we find 13 instructional programs in which at least 50 teachers are in need of update. Of these, auto mechanics,

Table 14

Need for Technological Update of Secondary Technical and Trade and Industry Teachers by Instructional Program in Seven Selected States

Technical and Trade and Industry Instructional Programs	Number of Teachers	Numbers and Percentages of Instructors in Need of Updating in the Technology of Their Teaching Field							
		No Need		Limited Need		Substantial Need		Critical Need	
		No.	%	No.	%	No.	%	No.	%
Air Conditioning/refrigeration	218	20	9	96	44	76	35	26	12
Appliance Repair	64	32	50	24	38	6	9	2	3
Auto Mechanics	1005	122	12	379	38	348	35	156	16
Auto Body	449	72	16	163	36	129	29	85	19
Aviation Mechanics	88	3	3	57	65	19	22	9	10
Building Construction	476	15	3	278	58	88	18	95	20
Business Machine Repair	7	3	43	4	57	0	0	0	0
Chemical Technology	11	9	82	1	9	0	0	1	9
Civil Technology	63	18	29	29	46	15	24	1	2
Commercial Art	123	44	36	53	43	14	11	12	10
Cosmetology	433	90	21	233	53	90	21	20	5
Data Processing (Computer)	95	77	81	6	6	6	6	6	6
Diesel Mechanics	112	25	22	35	31	29	26	23	21
Drafting	375	0	0	216	58	123	33	36	10

Table 14 (continued)

Numbers and Percentages of Instructors in Need of Updating in the Technology of Their Teaching Field

Technical and Trade and Industry Instructional Programs	Number of Teachers	No Need		Limited Need		Substantial Need		Critical Need	
		No.	%	No.	%	No.	%	No.	%
Electricity	272	20	7	86	32	109	40	57	21
Electronics	249	0	0	35	14	125	50	89	36
Environmental Technology	3	0	0	3	100	0	0	0	0
Fire Science	4	0	0	4	100	0	0	0	0
Fisheries	0	0	0	0	0	0	0	0	0
Food Service (Culinary Arts)	169	116	69	8	5	35	21	10	6
Heavy Equipment Maintenance	15	0	0	9	60	6	40	0	0
Masonry	174	35	20	105	60	32	18	2	1
Machine Trades	312	25	8	80	26	136	44	71	23
Mechanical Technology	10	2	20	0	0	8	80	0	0
Painting & Decorating	20	12	60	8	40	0	0	0	0
Photography	25	1	4	23	92	1	4	0	0
Plumbing	80	14	18	33	41	22	38	11	14
Police Science	43	2	5	38	88	3	7	0	0
Printing & Graphics	224	40	18	83	37	56	25	45	20
Radio-TV	134	11	8	75	56	31	23	17	13
Sheet Metal	56	19	34	24	43	11	20	2	2

Table 14 (continued)

Numbers and Percentages of Instructors in Need of Updating in the Technology of Their Teaching Field

Technical and Trade and Industry Instructional Programs	Number of Teachers	No Need		Limited Need		Substantial Need		Critical Need	
		No.	%	No.	%	No.	%	No.	%
Small Engine Repair	77	8	10	50	65	15	19	4	5
Textiles	45	3	7	13	29	24	53	5	11
Welding	456	78	17	204	45	118	26	56	12
Others	493	162	33	140	29	152	31	39	8
TOTALS	6380	1078	17	2595	41	1827	29	880	14

auto body, electronics, machine trades, welding, building construction, drafting, electricity, and cosmetology (in that order) lead, each with more than 100 teachers in need of update.

Consistency of Need within States

Consultants were asked if the level of need for technological update of teachers or instructors was consistent throughout their state or if the need was primarily a local condition. At the postsecondary level, consultants described the need for technological update as generally being statewide. They did note, however, that some local areas have greater need for teacher technological update than other local areas. Most consultants at the secondary level indicated that the need for technological update of secondary vocational teachers was consistent throughout the state.

Factors Contributing to Need for Technological Update

Consultants were asked the question, "To what do you attribute this need for technological update in your state?" Six examples of factors frequently associated with need for teacher technological update were provided to the consultants. A summary of their responses is shown in table 15. There appeared to be almost universal agreement in attributing the need for teacher technological update to new technological developments or applications, with 16 of the 18 consultants citing this factor. The total number of times the next 7 factors were cited was closely clustered in the range of from 5 to 9 times each. In rank order by number of times cited, these factors were: diffi-

Table 15

Summary of Consultant Responses Regarding
Factors to Which Technological Update Needs Are Attributed

Factors	Postsecondary Level	Secondary Level	Totals
New Technological Developments or Applications	9	7	16
Difficulty in Teacher Recruitment	5	4	9
New Business/Industry Entering Local Scene	4	3	7
Teacher Preparation	4	2	6
Teacher Away from Business/Industry Too Long*	3	2	5
Competition with Business/Industry for Personnel	3	5	8
Teacher Experience	3	4	7
Economic Development*		1	1

*Items not supplied to consultants as example factors.

culty in teacher recruitment, competition with business/industry for personnel, new business/industry entering local scene, teacher experience, teacher preparation, and teachers away from business/industry too long. Differences between postsecondary and secondary consultants' perceptions regarding factors responsible for the need for technological update appeared to be slight.

APPROACHES AND BARRIERS TO TEACHER TECHNOLOGICAL UPDATE

A number of approaches to technological updating of vocational/technical teachers are described in the literature as effective means for keeping teachers up to date in the technology of their instructional fields. Yet, indications were that large numbers of both secondary and postsecondary teachers were not taking advantage of existing opportunities for technological update. In this study of the status of teacher technological update, answers were sought to three major questions related to update approaches: (1) What approaches are now in use to provide technological update for teachers? (2) What are the barriers to successful technological update of teachers? and (3) Which of the approaches in current use offer the greatest potential for successful technological update of teachers? Summaries of both postsecondary and secondary consultants' responses to each of these questions follow.

Approaches to Update Currently in Use

Workshops, conferences, and seminars were found to be the most universally used approach to vocational/technical teacher update (table 16). This was true for both secondary level teachers and postsecondary instructors, with all but one of the eighteen consultants citing this approach. Consultants' papers indicated that university/college course work, summer employment, certification/recertification requirements, and university/college technical update programs were in use in approximately one-half of the states included in the study. The use of these approaches for updating secondary teachers and postsecondary instructors was roughly equal. Business/industry exchange programs and visits to business/industry were reported as being in use in approximately one-third of the states and for teachers at both the secondary and postsecondary levels.

Instructors' participation in business/industry training programs and business/industry technical update programs were each used by four states for postsecondary instructor update; however, they were not reported as in use at the secondary level for the states represented. Other approaches used at the post-secondary level but not at the secondary level were return-to-industry programs, hiring current business/industry employees, and inservice training conducted by state/local agency. Each of these was reported as used by two states. Each of the following was cited one time as an approach for updating secondary teachers: facilitation of performance-based teacher education, business/industry representatives serving on advisory

Table 16

Approaches to Vocational/Technical Teacher Technological Update Currently in Use in Eighteen Selected States

Approach Description	Numbers of States Reported to be Using the Approach: Postsecondary Level (N=9)	Secondary Level (N=9)	Totals
Workshops/Conferences/ Seminars	8	9	17
University/College Course Work	5	4	9
Summer Employment	4	5	9
Certification/Recertification Requirements	4	7	11
Instructor Participation in Business/Industry Training Programs	4		4
Business/Industry Technical Update Programs	4		4
University/College Technical Update Programs	3	5	8
Business/Industry Exchange Programs	3	3	6
Return-to-Industry Programs	2		2
Visits to Business/Industry	2	3	5
Hiring Current Business/ Industry Employees	2		2
Inservice Training Conducted by State/Local	2		2
Facilitation of Performance-Based Teacher Education		1	1
Business/Industry Representatives Serving on Advisory Committees		1	1
Business/Industry Representatives Participating in Curriculum Revision		1	1

committees, and business/industry representatives participating in curriculum revision.

Information provided in table 16 seems to indicate that cooperative efforts between education and business/industry are being utilized to a greater extent for the technological update of postsecondary instructors than for that of secondary teachers.

Both secondary and postsecondary consultants indicated that technological update approaches being utilized were being implemented on a statewide basis. They indicated, too, that utilization of the various approaches varied considerably among different occupational service areas within their respective states.

Barriers to Successful Technological Update

The unavailability of resources in terms of time, money, and links with external organizations (table 17) was perceived by most consultants as being a barrier to successful technological update of vocational/technical teachers. This was true for both secondary and postsecondary teacher update. Lack of awareness of need on the part of administrators and teachers and the lack of motivation by teachers and administrators were also indentified as barriers by nearly half of the consultants. Lack of equipment and lack of expertise were mentioned less frequently but were noted as barriers to teacher technological update at both the secondary and postsecondary levels. Included as barriers to secondary teacher update, but not mentioned for the postsecondary level, were lack of awareness of need on the part of

Table 17

Barriers to Successful Technological Update of Vocational/Technical Teachers in Eighteen Selected States

Barrier	Numbers of Consultants Citing Barrier: Postsecondary Level	Secondary Level	Total
Unavailability of Resources:			
Time	8	7	15
Money	9	8	17
Links with External Organizations	6	7	13
Equipment	2	2	4
Expertise	2	3	5
Lack of Awareness of Need:			
Administrators	4	5	9
Teachers	4	3	7
Business/Industry		2	2
Lack of Motivation by Teachers and Administrators	2	5	7
Lack of Planning by Administrators		3	3
Current Update Topics Not Based Upon Careful Needs Assessment		2	2

business/industry, lack of planning by administrators, and current update topics not based upon careful needs assessment.

Both secondary and postsecondary consultants generally perceived that the barriers they had identified were statewide in nature. Some, however, noted that barriers to update in some occupational areas were isolated locally.

Approaches with Greatest Potential for Success

Consultants almost universally agreed that two approaches to teacher technological update had high potential for success. As shown in table 18, these were (1) workshops/conferences/seminars and (2) collaborative activities/programs between schools and business/industry for teacher occupational experiences and curriculum content revision. At least one-half of the consultants also identified (a) inservice courses conducted by the university/college in cooperation with state/local agency and business/industry; (b) facilitation of summer employment of the teacher; and (c) modification of certification/recertification requirements. The latter approach was cited by twice as many secondary as postsecondary consultants. University/college course work was cited as a high-potential approach by nearly half the consultants. Only postsecondary consultants suggested instructor participation in business/industry training programs, professional meetings, and promotion of aggressive advisory committees as high-potential approaches to teacher update. Commitment to professional teacher organizations and facilitation of performance/competency-based education were cited as high-potential approaches by two secondary consultants.

Table 18

Approaches with Greatest Potential for Successful Technological Update of Vocational/Technical Teachers

Approach Description	Numbers of Consultants Citing Approach: Postsecondary Level (N=9)	Secondary Level (N=9)	Totals
Workshops/Conferences/ Seminars	8	9	17
Collaborative Activities/ Programs Between Schools and Business/Industry for Teacher Occupational Experiences and Curriculum Content Revision	8	8	16
Inservice Courses Conducted by University/College in Cooperation with State/ Local Agency and Business/ Industry	5	6	11
Modification of Certification/ Recertification Requirements	3	6	9
Facilitation of Summer Employment of Teachers	5	4	9
Instructor Participation in Business/Industry Training Programs	4		4
Professional Meetings	4		4
University/College Course Work	4	3	7
Teacher Visits to Business/Industry	2	3	5
Hiring Current Business/ Industry Employees	2	2	4
Commitment of Professional Teacher Organizations		2	2
Promotion of Aggressive Advisory Committees	2		2
Facilitation of Performance/ Competency-Based Education		2	2

Approaches to technological update are described in a forthcoming publication by Wonacott and Hamilton, which is a companion product to this study. In that document, generic descriptions of nine different approaches are presented along with advantages and disadvantages of each and relevant barriers and facilitators. Specific update programs are also provided that exemplify each approach.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

1. Large numbers of vocational/technical teachers at both the secondary and postsecondary levels are considered by qualified consultants to have substantial or critical need for updating in the technology of their teaching fields. Nearly one-half (47%) of all postsecondary instructors were considered in need of updating while close to one-third (30%) of secondary teachers were considered in need of update. In terms of numbers of teachers needing update, an estimated 4,462 postsecondary instructors in eight states and 8,178 secondary teachers in seven states were considered by consultants to be in substantial or critical need of update.

2. Need for teacher technological update exists for all occupational service areas, at both the secondary and post-secondary levels. By occupational area, substantial need and critical need for update ranged as high as 54% for postsecondary office occupations to a low of 27% for postsecondary marketing and distribution. For secondary vocational/technical teachers,

need for update by occupational area ranged from a high of 43% for technical and trade and industry to a low of 19% for occupational home economics.

3. Within occupational service areas, needs for teacher technological update vary widely by occupational program; however, teachers of many different instructional programs are in need of update. For example, within the technical and trade and industrial area, over 50% of the instructors in 19 of 34 post-secondary instructional programs were in need of technological update. The level of need for technological update was generally considered to be consistent throughout the states for both secondary teachers and postsecondary instructors.

5. New technological developments or applications were considered to be the major factor contributing to the need for teacher technological update at both the secondary and post-secondary levels. Difficulty in teacher recruitment, competition with business/industry for personnel, new business/industry entering local scene, teacher experience, teacher preparation, and teachers away from business/industry too long were also considered important contributors to the problem.

6. A variety of approaches to teacher technological update is used by each state, with workshops, conferences, and seminars in use almost universally. University/college course work, summer employment, certification/recertification requirements, and university/college technical update programs were in use in approximately one-half of the states with both secondary and postsecondary instructors. Business/industry exchange programs

and visits to business/industry were used to a lesser extent. Instructor participation in business/industry training programs and business/industry update programs were not reported as used for secondary teacher update; however, they were used in nearly one-half of the states reporting on postsecondary update approaches.

7. In spite of the variety of approaches being utilized, still large numbers of both secondary and postsecondary vocational/technical teachers remain in need of updating in the technology of their teaching fields.

8. Lack of resources, specifically money, time, and links with external organizations, is seen as the major barrier to successful technological update of vocational/technical teachers. Lack of awareness of the need and lack of motivation on the parts of administrators and teachers were also considered as barriers to technological update by nearly one-half of the consultants.

9. There was nearly universal agreement that the approaches having the greatest potential for successful technological update of vocational/technical teachers are (a) workshops, conferences, and seminars and (b) collaborative activities/programs between schools and business/industry for teacher occupational experiences and curriculum content revisions. Inservice courses conducted by universities/colleges in cooperation with state/local agencies and business/industry; modification of certification/recertification requirements; and facilitation of summer employment of the teacher were also ranked as high potential approaches.

10. Approaches considered to have high potential for teacher technological update were practically identical for both secondary and postsecondary teachers with the exception that certification/recertification was not considered as having as high potential for postsecondary as for secondary teachers.

Recommendations

Based upon the findings and conclusions of this status study and insight gained regarding the problems and issues surrounding successful technological update of vocational/technical teachers, the following recommendations are offered:

1. Successful teacher technological update programs exemplifying each of the "high-potential approaches" should be described in detail, published, and disseminated to all audiences concerned with teacher technological update.

2. Studies on the status of teacher technological update should be conducted on a state-by-state basis, since update programs tend to be planned and initiated on no broader than a statewide basis.

3. State plans for vocational teacher technological update should be developed by vocational service area and by occupational cluster as appropriate for both secondary and postsecondary level teachers.

4. Further research should be directed toward gaining greater insight into interplay of barriers and facilitators to successful teacher technological update.

5. Policy studies should be initiated to study ways that federal, state, university, and local district resources might

most effectively have an impact upon the problem of technological update of vocational/technical teachers.

6. An overall strategy should be developed for the technological update of vocational/technical teachers that builds upon strengths of existing approaches and facilitators, offers a new configuration of approaches and solutions to barriers, and identifies roles and responsibilities for each of the several agencies concerned with teacher technological update.

APPENDIX A

CONSULTANTS AND THEIR RESPECTIVE STATES

The following are consultants who authored papers on the status of technological update at the secondary level in their states:

- OKLAHOMA: Vic Van Hook, Associate State Director for Occupational Programs, Oklahoma Department of Education, Stillwater
- ALABAMA: James Kendrick, Director of Vocational Curriculum Development, Alabama Department of Education, Montgomery
- KENTUCKY: Charles W. Wade, Director, Division of Program Development, Kentucky Department of Education, Frankfort
- MICHIGAN: George Ferns, Professor of Secondary Education, Michigan State University, East Lansing
- MISSOURI: Franklin King, Professor of Industrial Education, University of Missouri, Columbia
- PENNSYLVANIA: Joyce R. Moyer, Research Associate, Pennsylvania Research Coordinating Unit, Harrisburg
- CONNECTICUT: Gloria Williams, Consultant for Professional Development, Connecticut Department of Education, Hartford
- UTAH: Gary Lloyd, State Specialist for Business Education, Utah Office of Education, Salt Lake City
- TEXAS: R.D. Bristow, Director, Texas Research Coordinating Unit, Texas Education Agency, Austin

The following are consultants who authored papers on the status of technological update at the postsecondary level in their states:

- NEBRASKA: Robert E. Klabenes, Campus Director, Southeast Technical Community College, Milford
- TENNESSEE: Thomas Delbridge, Director of Administrative Services, Tennessee Department of Education, Nashville

- SOUTH CAROLINA: G. William Dudley, Executive Director, State Board for Technical and Comprehensive Education, Columbia
- FLORIDA: W.R. Jeffries, Director of Programs and Staff Development Section, Florida Department of Education, Tallahassee
- INDIANA: Isaac K. Beckes, President Emeritus, Vincennes University, Vincennes
- ARIZONA: Eugene L. Dorr, Associate Director for Educational Services, State Board of Directors for Community Colleges, Phoenix
- WASHINGTON: James L. Blue, Consultant, Olympia
- MARYLAND: Joseph DeSantis, Specialist in Postsecondary and Adult Education, Maryland Department of Education, Baltimore
- MINNESOTA: Gerald Briggs, Teacher Education and Upgrading Specialist, Minnesota Department of Education, St. Paul

It should be noted that in several instances more than one individual contributed to the writing of the paper on the status of technological update. Consultant writers received the willing cooperation and assistance of co-workers, associates, and others in their efforts to gather perceptions concerning the status of technological update in their states; writers then coordinated this input in developing the paper itself.

APPENDIX B

PERCEPTIONS OF THE STATUS OF TECHNOLOGICAL UPDATE
OF SECONDARY VOCATIONAL/TECHNICAL TEACHERS

The Setting: Secondary Vocational/Technical Education in Your State

1. What specific programs are offered at the secondary level in your state in the occupational areas in the attached list? (You may indicate program offerings directly on the list if you wish. Please add any program offerings you do not find on the list.)

2. How many teachers are there in each of the programs you have listed?

3. In your state, are secondary vocational/technical teachers--

   subject to certification requirements?
   tenured?
   represented by unions or professional organizations?
   typically employed full-time or part-time?

The Problem: The Need for Technological Update of Teacher Skills

4. On the attached list of program offerings, please estimate the number of secondary teachers in each program offering you have listed for your state who have no need for technological update, limited need, substantial need, and critical need.

5. In what specific programs is the need for technological update of secondary vocational/technical teacher skills critical?

6. To what would you attribute this need for technological update in your state?

   EXAMPLES: teacher preparation
   teacher experience
   difficulty in teacher recruitment
   competition with business/industry for scarce workers
   new technological developments or applications
   new business/industry entering local scene

7. Is the need for technological update of secondary vocational/technical teacher skills consistent throughout your state or primarily local?

Potential Solutions: Promising Approaches and Barriers

8. What approaches are now being used in your state to provide technological update for secondary vocational/technical teachers?

   EXAMPLES: certification requirements
   recertification requirements
   university or college course work
   university of college technical update programs
   business/industry technical update programs

business/industry and education exchange programs
summer employment of teachers in business/industry
job sharing
hiring current business/industry employees as part-time staff
teacher participation in business/industry training programs

(For each approach identified, please give the name of the institution using the approach and the name of a contact person at that institution.)

9. Are these approaches being implemented statewide or locally? In all occupational areas?

10. What are the barriers to successful technological update of secondary vocational/technical teachers?

EXAMPLES: awareness of teachers, administrators, or others
motivation of teachers, administrators, or others
availability of resources (time, money, expertise, links with external organizations or persons)

11. Are these barriers statewide or local? Do they apply in all occupational areas?

12. In your opinion, which of the approaches used in your state offers the greatest potential for successful technological update of secondary vocational/technical teachers?

OCCUPATIONAL AREAS AND PROGRAM OFFERINGS

Occupational Area Name	Number of Teachers	Need for updating in the technology of their teaching field: Number having NO NEED	Number having LIMITED NEED	Number having SUBSTANTIAL NEED	Number having CRITICAL NEED
AGRICULTURE					
( ) Agricultural Production	___	___	___	___	___
( ) Agricultural Mechanics	___	___	___	___	___
( ) Agricultural Service	___	___	___	___	___
( ) Horticulture	___	___	___	___	___
( ) Other: _____	___	___	___	___	___
( ) _____	___	___	___	___	___
MARKETING AND DISTRIBUTION					
( ) General Merchandising	___	___	___	___	___
( ) Hotel/Motel	___	___	___	___	___
( ) Other: _____	___	___	___	___	___
( ) _____	___	___	___	___	___
HOME ECONOMICS - OCCUPATIONAL					
( ) Child Development	___	___	___	___	___
( ) Sewing and Tailoring	___	___	___	___	___
( ) Foods and Nutrition	___	___	___	___	___
( ) Interior Decorating	___	___	___	___	___
( ) Other: _____	___	___	___	___	___
( ) _____	___	___	___	___	___

Occupational Area Name	Number of Teachers	Need for updating in the technology of their teaching field: Number having NO NEED	Number having LIMITED NEED	Number having SUBSTANTIAL NEED	Number having CRITICAL NEED
HEALTH OCCUPATIONS					
( ) Nursing	___	___	___	___	___
( ) Medical Assistant	___	___	___	___	___
( ) Medical Laboratory Assistant	___	___	___	___	___
( ) Dental Assistant	___	___	___	___	___
( ) Dental Laboratory Assistant	___	___	___	___	___
( ) Inhalation Therapy	___	___	___	___	___
( ) Physical Therapy	___	___	___	___	___
( ) Occupational Therapy	___	___	___	___	___
( ) Operating Room Assistant	___	___	___	___	___
( ) Other: _____	___	___	___	___	___
( ) _____	___	___	___	___	___
( ) _____	___	___	___	___	___
OFFICE OCCUPATIONS					
( ) Typing	___	___	___	___	___
( ) Stenography	___	___	___	___	___
( ) Accounting	___	___	___	___	___
( ) Office Machines	___	___	___	___	___
( ) Word Processing	___	___	___	___	___
( ) Other: _____	___	___	___	___	___
( ) _____	___	___	___	___	___

Occupational Area Name	Number of Teachers	Need for updating in the technology of their teaching field: Number having NO NEED	Number having LIMITED NEED	Number having SUBSTANTIAL NEED	Number having CRITICAL NEED
TECHNICAL & TRADE & INDUSTRY					
( ) Air Conditioning - Regrigeration	___	___	___	___	___
( ) Appliance Repair	___	___	___	___	___
( ) Auto Mechanics	___	___	___	___	___
( ) Auto Body	___	___	___	___	___
( ) Aviation Mechanics	___	___	___	___	___
( ) Building Construction	___	___	___	___	___
( ) Business Machine Repair	___	___	___	___	___
( ) Chemical Technology	___	___	___	___	___
( ) Civil Technology	___	___	___	___	___
( ) Commercial Art	___	___	___	___	___
( ) Cosmetology	___	___	___	___	___
( ) Data Processing (Computer)	___	___	___	___	___
( ) Diesel Mechanics	___	___	___	___	___
( ) Drafting	___	___	___	___	___
( ) Electricity	___	___	___	___	___
( ) Electronics	___	___	___	___	___
( ) Environmental Technology	___	___	___	___	___
( ) Fire Science	___	___	___	___	___
( ) Fisheries	___	___	___	___	___
( ) Food Service (Culinary Arts)	___	___	___	___	___

Occupational Area Name	Number of Teachers	Need for updating in the technology of their teaching field: Number having NO NEED	Number having LIMITED NEED	Number having SUBSTANTIAL NEED	Number having CRITICAL NEED
( ) Heavy Equipment Maintenance	___	___	___	___	___
( ) Masonry	___	___	___	___	___
( ) Machine Trades	___	___	___	___	___
( ) Mechanical Technology	___	___	___	___	___
( ) Painting & Decorating	___	___	___	___	___
( ) Photography	___	___	___	___	___
( ) Plumbing	___	___	___	___	___
( ) Police Science	___	___	___	___	___
( ) Printing & Graphics	___	___	___	___	___
( ) Radio-TV	___	___	___	___	___
( ) Sheet Metal	___	___	___	___	___
( ) Small Engine Repair	___	___	___	___	___
( ) Textiles	___	___	___	___	___
( ) Welding	___	___	___	___	___
( ) Other: _____	___	___	___	___	___
( ) _____	___	___	___	___	___
( ) Other: _____	___	___	___	___	___
( ) _____	___	___	___	___	___
( ) _____	___	___	___	___	___
( ) _____	___	___	___	___	___

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